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An Empirical Study of the Effect of Robot Programming Education on the Computational Thinking of Young Children: The Role of Flowcharts

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Abstract : There is an increasing interest in introducing computational thinking at an early age. Computational thinking, like mathematical thinking, engineering thinking, and scientific thinking, is a kind of analytical thinking. Learning computational thinking skills is not only to improve technological literacy, but also allows learners to equip with practicable skills such as problem-solving skills. As people realize the importance of computational thinking, the field of educational technology faces a problem: how to choose appropriate tools and activities to help students develop computational thinking skills. Robots are gradually becoming a popular teaching tool, as robots provide a tangible way for young children to access to technology, and controlling a robot through programming offers them opportunities to engage in developing computational thinking. This study explores whether the introduction of flowcharts into the robotics programming courses can help children convert natural language into a programming language more easily, and then to better cultivate their computational thinking skills. An experimental study was adopted with a sample of children ages six to seven (N = 16) participated, and a one-meter-tall humanoid robot was used as the teaching tool. Results show that children can master basic programming concepts through robotic courses. Children's computational thinking has been significantly improved. Besides, results suggest that flowcharts do have an impact on young children’s computational thinking skills development, but it only has a significant effect on the "sequencing" and "correspondence" skills. Overall, the study demonstrates that the humanoid robot and flowcharts have qualities that foster young children to learn programming and develop computational thinking skills.

Keywords : robotics, computational thinking, programming, young children, flow chart
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